Composite Optimization and Practice of Therapeutic Environment in Urban Green Spaces from Multi-level Perspectives

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Abstract: With the acceleration of urbanization, urban residents are confronted with increasingly serious physical and mental health problems. As an important public space with healing functions, the optimization of the healing environment of urban green Spaces has become a key issue in improving the quality of life of residents. Based on a multi-level perspective, this paper systematically analyzes the constituent elements and existing problems of the therapeutic environment in urban green Spaces from three levels: micro-individual perception, meso-spatial layout, and macro-policy planning. It proposes a compound optimization strategy to provide theoretical references and practical guidance for the construction and optimization of the therapeutic environment in urban green Spaces.

1. Introduction

Against the backdrop of rapid urbanization, high-density urban Spaces, high-intensity work pressure and complex social environments have led to a high incidence of mental health problems such as anxiety and depression among residents. The threat of "urban diseases" to the physical and mental health of residents is becoming increasingly prominent. Research by the World Health Organization shows that urban green Spaces, as the connecting link between nature and the city, can relieve residents' psychological stress and improve their physical health by regulating microclimate, purifying air and providing leisure Spaces, and have significant therapeutic functions. In recent years, concepts such as "therapeutic landscapes" and "healthy cities" have gradually become research hotspots in the fields of urban planning and landscape design. How to enhance the therapeutic level of urban green Spaces and meet residents' demands for healthy living Spaces has become an important task currently faced by urban development.

2. Core concept definition

2.1 Urban Green Space

Urban green space refers to urban land where natural vegetation and artificial vegetation are the main forms of existence, including types such as park green space, protective green space, square land, affiliated green space, and regional green space, which have multiple functions such as ecology, society, culture, and healing [1]. This article focuses on park green Spaces and square land with public accessibility that can provide residents with leisure and recreational services, and particularly explores the realization and optimization of their therapeutic functions.

2.2 Therapeutic Environment

The concept of therapeutic environment originated from the "therapeutic landscape" theory in the 1960s, referring to a spatial environment that can alleviate individual physical discomfort, reduce psychological stress, and promote the recovery of physical and mental health through environmental elements. The core of the therapeutic environment in urban green Spaces lies in meeting individuals' needs for contact with nature through natural elements and spatial design, stimulating positive psychological emotions and physiological responses, and achieving the effect of "natural healing".

2.3 Multi-level perspectives

The multi-level perspective originated from sociological and ecological research, emphasizing the analysis of problems from different levels and focusing on the interaction and dynamic balance among these levels. This article, in light of the characteristics of the therapeutic environment in urban green Spaces, defines the multi-level perspective as the micro-individual perception level, the meso-spatial layout level, and the macro-policy planning level. These three levels are interrelated and influence each other, jointly determining the quality of the therapeutic environment in urban green Spaces.

3. Existing problems of therapeutic environments in urban green Spaces from multi-level perspectives

3.1 Micro Level

(1) Monotonous sensory stimulation

Urban green space design often takes visual landscape as the core orientation, overly focusing on visual elements such as flower arrangement and sculpture arrangement, while seriously insufficient investment in the design of other sensory dimensions such as hearing, smell and touch. This monotonous sensory design model leads to individuals being unable to obtain a comprehensive sensory experience in the green space, making it difficult to stimulate multi-dimensional natural healing responses and weakening the healing effect of the green space.

(2) Poor adaptability to psychological needs

There are significant differences in the psychological healing needs of different groups of people. The core demand of the elderly for space is a quiet and safe resting environment. Children need exploratory activity Spaces to satisfy their curiosity and creativity development. People under stress rely on private and peaceful solitary Spaces to relieve their psychological burdens. At present, there

is a widespread tendency of "homogenization" in urban green space design, lacking personalized spatial division tailored to the psychological needs of different groups of people, which makes it difficult to effectively meet the psychological healing needs of all kinds of people [2].

(3) Low convenience in behavioral experience

The behavioral experience of an individual in the green space directly determines the degree to which the healing effect is achieved. At present, some urban green Spaces have obvious deficiencies in the design of behavioral experience. The planning of walking paths is unreasonable, and there are problems such as excessive slope and insufficient road surface flatness. The density of service facility configuration is low, and the number of infrastructures such as drinking water points and restrooms is insufficient. The design of the sign system is not clear, and it cannot provide users with accurate path guidance and facility location prompts. These problems collectively lead to a decline in the convenience of using green Spaces and affect individuals' healing experiences.

3.2 Meso level

(1) Fragmentation of spatial structure

Constrained by urban land use planning, the spatial distribution of urban green Spaces mostly presents "point-like" or "band-like" characteristics, lacking a continuous and integrated green network system, and having poor spatial connectivity [3]. Meanwhile, the internal space division of the green space lacks scientific planning. There are no effective transition and integration Spaces set up between functional areas, which easily leads to mutual interference caused by the direct adjacency of functional areas, further affecting the overall therapeutic atmosphere of the green space.

(2) The functional configuration is monotonous

The healing function of urban green Spaces needs to be achieved through the synergistic effect of diverse spatial functions such as rest, activities, and nature observation. At present, some urban green Spaces have a design tendency of "emphasizing aesthetics over functionality", and their functional configurations are relatively single. Some green Spaces only focus on creating ornamental landscapes, lacking recreational facilities that meet the needs of staying and venues that satisfy the demands of activities. Although some green Spaces are equipped with basic fitness functions, they lack specialized Spaces centered on natural healing, resulting in insufficient functional diversity and inability to meet the diverse healing needs of residents.

(3) Unreasonable allocation of natural factors

Natural elements are the core carriers of the therapeutic nature of urban green Spaces, and the rationality of their configuration directly affects the therapeutic effect. At present, some green Spaces have three major problems in the allocation of natural elements. The first is the homogenization of vegetation selection, with an excessively high proportion of exotic ornamental plants and a relatively low proportion of native plants. This not only reduces the stability of the ecosystem but also weakens the emotional connection between residents and the local nature. Second, the design of water bodies is formalistic. Artificial water bodies lack an ecological circulation system, which makes them prone to problems such as deteriorating water quality and unpleasant odors, and thus unable to fulfill their therapeutic functions. Thirdly, there is insufficient soil coverage. The extensive use of hardened ground reduces the contact between natural soil and air, thereby lowering the microclimate regulation capacity and natural healing properties of green Spaces [4].

3.3 Macro Level

(1) The absence of policies and regulations

The current policies and regulations related to urban green Spaces in our country mainly focus on ecological protection and landscape construction. No special policy documents have been formulated for the therapeutic functions of green Spaces yet, resulting in a lack of clear policy basis for the construction of therapeutic green Spaces. Meanwhile, the assessment criteria for the therapeutic effects of green Spaces have not yet been established, making it impossible to quantitatively evaluate the therapeutic functions of green Spaces and difficult to clarify the direction of optimization.

(2) Insufficient planning coordination

At present, there is a lack of an effective connection mechanism among various types of plans, and there are problems of independent compilation and acting independently. During the stage of determining the nature of land in territorial space planning, the therapeutic function requirements of green Spaces were not fully considered, resulting in a low matching degree between the layout of green Spaces and the needs of residents. The connection between the overall urban planning and the green space system planning is not smooth. The layout of green space has not been effectively combined with the urban transportation planning and public service facility planning, which affects the accessibility and convenience of residents' use.

(3) The guarantee mechanism is not sound

The therapeutic environment of urban green Spaces requires long-term maintenance and continuous optimization. Currently, there are obvious shortcomings in the guarantee mechanism, and the structure of capital investment is unbalanced. Most of the funds for green space construction are invested in landscape renovation and facility maintenance, while the proportion of funds used for the optimization of the therapeutic environment is relatively low. Insufficient technical and talent support, as well as a lack of professional therapeutic landscape design talents and technology research and development teams, make it difficult to implement therapeutic optimization strategies. The public participation mechanism is not perfect. Residents have insufficient say in the entire process of green space planning, design and maintenance, which fails to fully reflect their healing needs and leads to a disconnection between green space construction and actual demands.

4. Composite Optimization Strategies for the Therapeutic environment of Urban Green Spaces from multi-level Perspectives

4.1 Micro Level

(1) Multi-sensory collaborative design

Combining the theory of natural healing, a five-in-one sensory experience system of "vision - hearing - smell - touch - taste" is constructed. The specific design strategy is shown in Table 1.

(2) Personalized space creation

Divide differentiated spatial areas according to the psychological needs of different groups of people. For the elderly, a quiet rest area is set up, equipped with comfortable seats, sunshade and rain protection facilities, and plants symbolizing longevity and good fortune are planted to create a peaceful and safe atmosphere. For children, set up a natural exploration area, design facilities such as sandpits, climbing frames, and small streams, and plant observable plants like sunflowers and morning glories to stimulate children's desire to explore. For people under stress, a private healing area is set up. The enclosed space is created by using vegetation and terrain, equipped with single-person seats and meditation platforms to reduce external distractions and meet the needs of solitude and meditation. At the same time, set up universal Spaces to meet the interaction needs of different groups of people and promote social connections [5].

(3) Convenient facility configuration

Optimize the design of walking paths, adopt gentle slope design, select flat and anti-slip

pavement materials, and set up handrails and rest platforms on steep slopes. Increase the density of service facilities, set up drinking water points and restrooms every 300 meters along walking paths, and establish convenience stores and medical emergency points near rest areas. Improve the signage system by using clear and uniform signboards to indicate the direction of the path, distance and location of facilities. At the same time, set up blind paths and voice prompts to meet the needs of special groups.

Table 1 Design of the Five-in-One Sensory System

Sensory type	Design strategy	Case reference
Vision	A multi-layer vegetation configuration of "trees - shrubs - grass" is adopted, combined with plants with obvious seasonal changes, to create a rich visual layering	Plant cherry blossoms in spring, crape myrtles in summer, ginkgo trees in autumn and cedars in winter
Hearing	Set up natural water features and bird habitats, and introduce facilities such as wind chimes and canopies to produce natural sounds	Set up small streams near the rest area and plant berry plants that attract birds
Sense of smell	Plant fragrant plants in the rest area and on both sides of the walkways, and combine them according to the seasons to ensure a pleasant aroma throughout the year	In spring, plant lilacs; in summer, mint; in autumn, osmanthus; and in winter, wintersweet
Touch	Select ground materials of different textures such as wood, gravel and grass, and set up touchable vegetation	The children's area is equipped with a lawn floor. The walkway is paved with pebbles and covered with downy plants
Taste	Set up a vegetable and fruit planting area in the community green space, allowing residents to pick fruits, and establish an herb tea experience point	Grow tomatoes, cucumbers and other easy-to-grow fruits and vegetables, and provide mint tea in the rest area

4.2 Meso level

(1) Build a continuous green network

Combining the theory of spatial syntax, optimize the spatial layout of green Spaces and construct a green network that integrates "points, lines and surfaces". Strengthen the core role of park green Spaces and community green Spaces at the "point" level and enhance their therapeutic level. Build green corridors on the "line" to connect scattered green Spaces. Through ecological designs such as planting native plants and setting up pedestrian paths, ensure the continuity and accessibility of the corridors. Integrate green Spaces with surrounding public service facilities on the "surface" to form a "green space +" complex, enhancing the service radius and utilization efficiency of green Spaces [6].

(2) Improve the multi-functional zoning

Based on the behavioral needs of residents and the goals of healing functions, diverse functional zones are divided, and the organic integration of each zone is achieved. The specific zone design is shown in Table 2.

(3) Optimize the allocation of natural factors

Give priority to using native plants to build a stable plant community and enhance ecological stability and natural healing effects. For instance, in northern cities, native plants such as oil pine, sophora japonica and lilac are selected, while in southern cities, native plants like camphor,

osmanthus and camellia are chosen. Rationally design water body landscapes, adopt ecological circulation systems such as artificial wetlands and rain gardens to ensure clean water quality, and at the same time set up waterside platforms and walkways to enhance the interaction between residents and water bodies. Reduce the proportion of hardened ground, increase the area covered by soil, use permeable pavement materials, and enhance the microclimate regulation capacity and natural texture of green Spaces [7].

Table 2 Multi-functional Zoning Design

Functional zoning	Core healing objective	Configuration of key facilities	Transitional space design
Natural healing area	Utilize natural elements to relieve psychological stress and restore attention	Forest trails, wetland landscapes, and meditation platforms	Plant flower borders to form a natural transition zone
Activity and fitness area	Improve physical health and relieve stress through physical exercise	Fitness trails, ball courts, fitness equipment	Set up hedges to block out noise and visibility
Social Interaction Area	Promote communication among residents and enhance a sense of social connection	Picnic area, open-air theater, movable seats	Low shrubs are used for separation to maintain the openness of the space
Cultural Experience Zone	Strengthen the connection between residents and local culture and enhance cultural identity	Native Plant Exhibition Area, Healing Culture Science Popularization Museum	Lay cultural floor tiles to guide the transition of people flow

4.3 Macro Level

(1) Improve the policy and legal system

Formulate special policies for the therapeutic environment of urban green Spaces and incorporate the therapeutic function into the target system of urban green space construction. Supplement the relevant content on healing in the existing policy documents and clearly define the requirements and standards for the construction of a healing environment. At the same time, an evaluation index system for the therapeutic effects of green Spaces should be established. Quantitative indicators should be set from dimensions such as sensory experience, psychological feedback, and usage frequency. Regular evaluation work should be carried out to provide data support for the optimization direction [8]. In addition, encouraging policies should be introduced to provide subsidies or rewards for projects that carry out the construction of therapeutic green Spaces, thereby stimulating the enthusiasm of market entities and social forces to participate.

(2) Strengthen the coordinated and interactive planning

Establish a multi-level planning coordination mechanism of "territorial space planning - urban master planning - green space system planning - detailed planning". During the stage of territorial space planning, sufficient green space should be reserved, with priority given to planning therapeutic green Spaces in densely populated areas, around hospitals, and near schools. During the urban master planning stage, the therapeutic function positioning of green Spaces should be clearly defined, and the layout of green Spaces should be combined with transportation planning and public service facility planning to enhance the accessibility of green Spaces [9]. During the green space system planning stage, the layout and scale of therapeutic green Spaces should be detailed, and the direction and connection methods of green corridors should be determined. During the detailed

planning stage, the specific requirements for therapeutic design should be implemented to ensure that the design at the micro level is in line with the macro and meso planning. At the same time, a cross-departmental collaboration mechanism should be established, with departments such as natural resources, housing and urban-rural development, gardens, and health and wellness jointly participating in the planning and design of green Spaces. This will break down departmental barriers and achieve information sharing and collaborative decision-making in planning.

(3) Improve the guarantee mechanism

In terms of financial guarantee, a diversified capital investment model of "government-led + social participation" should be established. The government has increased the fiscal budget for the construction of therapeutic green Spaces and established a special fund. At the same time, attract social capital to participate through the PPP model, social donations and other means. In terms of technical and talent support, it is necessary to enhance cooperation between universities and research institutions, offer professional courses related to therapeutic landscape design, and cultivate professional talents. At the same time, a technical training system should be established, and regular therapeutic landscape design technology training should be provided to planners and designers to enhance their professional capabilities. In terms of public participation, an "online + offline" public participation platform has been established. Online, planning schemes are released through the government's official website and social media, and residents' opinions are collected. Organize public hearings and design workshops offline, and invite residents to participate in the green space planning and design process to ensure that the green space construction meets the residents' healing needs [10].

5. Conclusion

This article systematically explores the issues and optimization paths of therapeutic environment construction in urban green Spaces from a multi-level perspective including micro-individual perception, meso-spatial layout, and macro-policy planning. Research has found that current green Spaces have problems such as single micro-sensory experience, insufficient psychological adaptation, low convenience of facilities, fragmented meso-space, single functions, unreasonable allocation of natural elements, absence of macro policies, weak planning coordination, and incomplete guarantee mechanisms. Based on this, a composite strategy of micro multi-sensory collaboration and personalized design, meso green network construction and functional optimization, and macro policy improvement and guarantee strengthening is proposed, forming a complete logical chain of "problem - strategy - practice". Future research can further enhance interdisciplinary cooperation and quantitatively analyze the therapeutic effects of green Spaces. Integrating intelligent technologies, we explore a new healing model of "virtual + physical" to provide more precise theoretical support and practical guidance for the construction of healthy cities.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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